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ABSTRACT

This booklet contains nine sections describing ways in which noise may endanger health and well-being. Secions are included on: (1) hearing loss; (2) heart disease; (3) other reactions by the body; (4) effects on the unborn; (5) special effects on children; (6) intrusion at home and work; (7) sleep disruption; (8) mental and social well-being; and (9) danger to life and limb. (CS)

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Environmental Protection Agency
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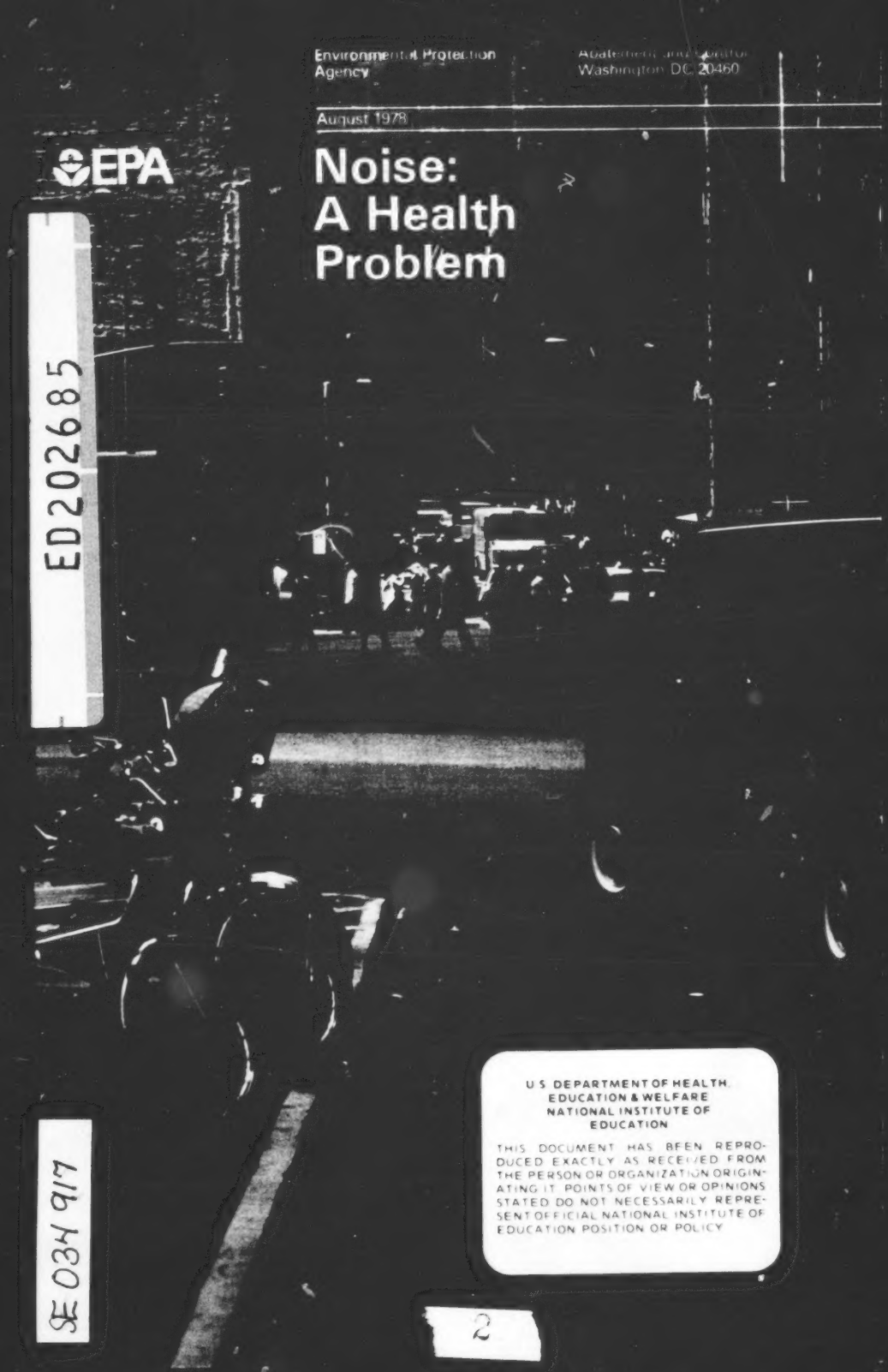
Noise: A Health Problem



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"Health is a state of complete physical, mental and social well-being. Governments have a responsibility for the health of their people which can be fulfilled only by the provision of adequate health and social measures."

World Health Organization

Introduction

Racket, din, clamor, noise. Whatever you want to call it, unwanted sound is America's most widespread nuisance. But noise is more than just a nuisance. It constitutes a real and present danger to people's health. Day and night, at home, at work, and at play, noise can produce serious physical and psychological stress. No one is immune to this stress. Though we seem to adjust to noise by ignoring it, the ear, in fact, never closes and the body still responds — sometimes with extreme tension, as to a strange sound in the night.

The annoyance we feel when faced with noise is the most common outward symptom of the stress building up inside us. Indeed, because irritability is so apparent, legislators have made public annoyance the basis of many noise abatement programs. The more subtle and more serious health hazards associated with stress caused by noise traditionally have been given much less attention. Nonetheless, when we are annoyed or made irritable by noise, we should consider these symptoms fair warning that other things may be happening to us, some of which may be damaging to our health.

Of the many health hazards related to noise, hearing loss is the most clearly observable and measurable by health professionals. The other hazards are harder to pin down. For many of us, there may be a risk that exposure to the stress of noise increases susceptibility to disease and infection. The more susceptible among us may experience noise as a complicating factor in heart problems and other diseases. Noise that causes annoyance and irritability in healthy persons may have serious consequences for those already ill in mind or body.

Noise affects us throughout our lives. For example, there are indications of effects on the unborn child when mothers are exposed to industrial and environmental noise. During infancy and childhood, youngsters exposed to high noise levels may experience learning difficulties and generally suffer poorer health. Later in life, the elderly may have trouble falling asleep and obtaining necessary amounts of rest.

Why, then, is there not greater alarm about these dangers? Perhaps it is because the link between noise and many disabilities or diseases has not yet been conclusively demonstrated. Perhaps it is because we tend to dismiss annoyance as a price to pay for living in the modern world. It may also be because we still think of hearing loss as only an occupational hazard.

The effects of noise on health are often misunderstood or unrecognized. Well-documented studies to clarify the role of noise as a public health hazard are still required, but we at least know from existing evidence that the danger is real. In the following nine sections, this booklet describes the ways that noise endangers our health and well-being:

Hearing Loss
Heart Disease
The Body's Other Reactions
Noise and the Unborn
Special Effects on Children
Intrusion at Home and Work
Sleep Disruption
Mental and Social Well-Being
Danger to Life and Limb

"Deafness, like poverty, stunts and deadens its victims." Helen Keller

Hearing Loss

Noise loud enough to cause hearing loss is virtually everywhere today. Our jobs, our entertainment and recreation, and our neighborhoods and homes are filled with potentially harmful levels of noise. It is no wonder then that 20 million or more Americans are estimated to be exposed daily to noise that is permanently damaging to their hearing.

When hearing loss occurs, it is in most cases gradual, becoming worse with time. The first awareness of the damage usually begins with the loss of occasional words in general conversation and with difficulty understanding speech heard on the telephone. Unfortunately, this recognition comes too late to recover what is lost. By then, the ability to hear the high frequency sounds of, for example, a flute or piccolo or even the soft rustling of leaves will have been permanently diminished. As hearing damage continues, it can become quite significant and handicapping. And there is no cure. Hearing aids do not restore noise-damaged hearing, although they can be of limited help to some people.

People with partial deafness from exposure to noise do not necessarily live in a quieter world. The many sounds still audible to them are distorted in loudness, pitch, apparent location, or clarity. Consonants of speech, especially high frequency sounds such as "s" and "ch," are often lost or indistinguishable from other sounds. Speech frequently seems garbled, sounding as if the speaker has his or her "head in a barrel." When exposed to a very loud noise, people with partial hearing loss may experience discomfort and pain. They also frequently suffer from tinnitus — irritating ringing or roaring in the head.

There is even further pain the hard-of-hearing person faces: the emotional anguish caused, perhaps unintentionally, by friends and associates who become less willing to be partners in conversation or companions in other activities. Indeed, the inability to con-

verse normally makes it difficult for partially deaf people to participate in lectures, meetings, parties, and other public gatherings. For a person with hearing loss, listening to TV, radio, and the telephone — important activities of our lives — is difficult, if not impossible.

As hearing diminishes, a severe sense of isolation can set in. The greater the hearing loss, the stronger the sense of being cut off from the rest of the world. What eventually may be lost is the ability to hear enough of the incidental sounds that maintain our feeling of being part of a living world. The emotional depression following such hearing loss is much the same, whether the impairment has been sudden or gradual.

The idea that hearing loss is solely the result of industrial noise is dangerously erroneous. Noise levels in many places and in some of the transportation vehicles we use are well above the levels believed to cause hearing damage over prolonged periods. As a rule, whenever we need to raise our voices to be heard, the background noise may be too loud and should be avoided.

Noise can cause permanent hearing damage

People with hearing loss suffer discomfort and social isolation

Hearing loss is not solely an occupational hazard

"We now have millions with heart disease, high blood pressure, and emotional illness who need protection from the additional stress of noise." Dr. Samuel Rosen, Mt. Sinai Hospital

Heart Disease

While no one has yet shown that noise inflicts any measurable damage to the heart itself, a growing body of evidence strongly suggests a link between exposure to noise and the development and aggravation of a number of heart disease problems. The explanation? Noise causes stress and the body reacts with increased adrenaline, changes in heart rate, and elevated blood pressure.

Noise, however, is only one of several environmental causes of stress. For this reason, researchers cannot say with confidence that noise alone caused the heart and circulatory problems they have observed. What they can point to is a statistical relationship apparent in several field and laboratory studies.

The best available studies are those that have been conducted in industrial settings. For example, steel workers and machine shop operators laboring under the stress of high noise levels had a higher incidence of circulatory problems than did workers in quiet industries. A German study has documented a higher rate of heart disease in noisy industries. In Sweden, several researchers have noted more cases of high blood pressure among workers exposed to high levels of noise.

Some laboratory tests have produced observable physical changes. In one instance, rabbits exposed for 10 weeks to noise levels common to very noisy industries developed a much higher level of blood cholesterol than did unexposed rabbits on the same diet.

Similarly, a monkey subjected to a day-long tape recording of the normal street noises outside a hospital developed higher blood pressure and an increased heart rate. In a test on humans, people subjected to moderately loud noise during different states of sleep exhibited constriction of the outer blood vessels.

Among the more serious recent findings in settings other than the laboratory or industry is the preliminary conclusion that

grade school children exposed to aircraft noise in school and at home had higher blood pressures than children in quieter areas. The exact implications for these children's health are not known, but certainly this finding is cause for serious concern.

Because the danger of stress from noise is greater for those already suffering from heart disease, physicians frequently take measures to reduce the noise exposure of their patients. For instance, a town in New Jersey moved a firehouse siren away from the home of a boy with congenital heart disease when his doctor warned that the sound of the siren could cause the boy to have a fatal spasm. Another doctor ordered a silencing device for the phone of a recuperating heart patient.

As William Stewart, former Surgeon General of the United States, has pointed out, there are many incidents of heart disease occuring daily in the U.S. for which "the noise of twentieth century living is a major contributory cause." While the precise role of noise in causing or aggravating heart disease remains unclear, the illness is such a problem in our society that even a small increase in the percentage of heart problems caused by noise could prove debilitating to many thousands of Americans.

Noise may produce high blood pressure, faster heart rates, and increased adrenaline

Noise may contribute to heart and circulatory disease

"Loud noises once in a while probably cause no harm. But chronic noise situations must be pathological. Constant exposure to noise is negative to your health."
Dr. Gerd Jansen, Ruhr University

The Body's Other Reactions

In readiness for dangerous and harmful situations, our bodies make automatic and unconscious responses to sudden or loud sounds. Of course, most noise in our modern society does not signify such danger. However, our bodies still react as if these sounds were always a threat or warning.

In effect, the body shifts gears. Blood pressure rises, heart rate and breathing speed up, muscles tense, hormones are released into the bloodstream, and perspiration appears. These changes occur even during sleep.

The idea that people get used to noise is a myth. Even when we think we have become accustomed to noise, biological changes still take place inside us, preparing us for physical activity if necessary.

Noise does not have to be loud to bring on these responses. Noise below the levels usually associated with hearing damage can cause regular and predictable changes in the body.

What happens to the human body when confronted with ever-present noise? In a world where steady bombardment of noise is the rule rather than the exception, the cumulative effects of noise on our bodies may be quite extensive. It may be that our bodies are kept in a near-constant condition of agitation. Researchers debate whether the body's automatic responses build on each other, leading to what are called the "diseases of adaptation." These diseases of stress include ulcers, asthma, high blood pressure, headaches, and colitis.

In studies dating back to the

1930s, researchers noted that workers chronically exposed to noise developed marked digestive changes which were thought to lead to ulcers. Cases of ulcers in certain noisy industries have been found to be up to five times as numerous as what normally would be expected.

Similar research has identified more clearly the contribution of noise to other physical disorders. A five-year study of two manufacturing firms in the United States found that workers in noisy plant areas showed greater numbers of diagnosed medical problems, including respiratory ailments, than did workers in quieter areas of the plants.

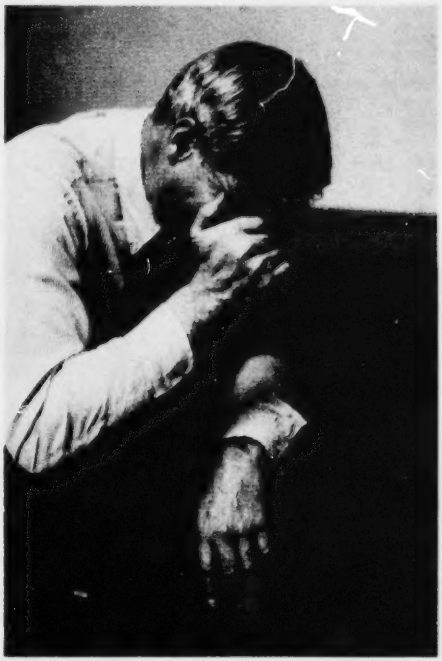
From a study done with animals, researchers concluded that noise may be a risk factor in lowering people's resistance to disease and infection.

To prevent aggravation of existing disease, doctors and health researchers agree that there is an absolute requirement for rest and relaxation at regular intervals to maintain adequate mental and physical health. Constant exposure to stress from noise frustrates this requirement. In doing so, it has a potentially harmful effect on our health and well-being.

Noise can cause regular and predictable stress in the human body

People do not get used to noise — the body continues to react

Noise may aggravate existing disease



"There is ample evidence that environment has a role in shaping the physique, behavior and function of animals, including man, from conception and not merely from birth. The fetus is capable of perceiving sounds and responding to them by motor activity and cardiac rate change."
Lester W. Sontag, The Fels Research Institute

Noise and the Unborn

While still in its mother's womb, the developing child is responsive to sounds in the mother's environment. Particularly loud noises have been shown to stimulate the fetus directly, causing changes in heartrate. Related work also has demonstrated that, late in pregnancy, the fetus can respond to noise with bodily movements such as kicking.

Just as the fetus is not completely protected from environmental noise, the fetus is not fully protected from its mother's response to stress, whether it be caused by noise or other factors. When her body reacts to noise, the physical changes she experiences may be transmitted to the fetus. And it is known that the fetus is capable of responding to some changes in the mother's body of the type produced by emotion, noise, or other forms of stress.

In contrast to the more direct risk, this indirect fetal response may threaten fetal development if it occurs early in pregnancy. The most important period is about 14 to 60 days after conception. During this time, important developments in the central nervous system and vital organs are taking place. Unfortunately, women are often unaware that they are pregnant for much of this period, and are thus unlikely to take extra precautions.

While very little research has addressed these questions, due to the difficulties of studying humans in this respect, certain suggestive human research has been done.

A Japanese study of over 1,000 births produced evidence of a high proportion of low-weight babies in noisy areas. These birth weights were under 5½ pounds, the World Health Organization's

definition of prematurity. Low birth weights and noise were also associated with lower levels of certain hormones thought to affect fetal growth and to be a good indicator of protein production. The difference between the hormone levels of pregnant mothers in noisy versus quiet areas increased as birth approached.

Studies have also shown that stress causes constriction of the uterine blood vessels which supply nutrients and oxygen to the developing baby. Additional links between noise and birth defects have been noted in a recent preliminary study on people living near a major airport. The abnormalities suggested included harelips, cleft palates, and defects in the spine.

Taken together, this information points to the possibility of serious effects of noise on the growth and development of the unborn child. While it cannot be said at what level maternal exposures to industrial and environmental noise are dangerous to the fetus, these findings do create some concern. It is known that extreme stress of any type will certainly take a toll on the fetus, but, in the case of noise, it is not known how much is required to have an effect. Whatever the effect, the risk of even a slight increase in birth defects is considerably disturbing.

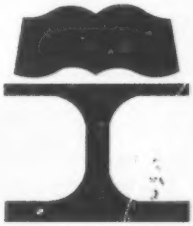
The fetus is not fully protected from noise

Noise may threaten fetal development

Noise has been linked to low birth weights

"Levels of noise which do not interfere with the perception of speech by adults may interfere significantly with the perception of speech by children as well as with the acquisition of speech, language, and language-related skills." National Academy of Sciences Report

Special Effects on Children



Good health includes the ability to function mentally as well as physically. This is especially true during growth and development.

Adults have worried about the effects of noise on children ever since the early 1900s when "quiet zones" were established around many of the nation's schools. These protective areas were intended to increase educational efficiency by reducing the various levels of noise that were believed to interfere with children's learning and even hamper their thinking ability.

Today's worries are little changed from those of the past. Researchers looking into the consequences of bringing up children in this less-than-quiet world have discovered that learning difficulties are likely byproducts of the noisy schools, play areas, and homes in which our children grow up. Two primary concerns are with language development and reading ability.

Because they are just learning, children have more difficulty understanding language in the presence of noise than adults do. As a result, if children learn to speak and listen in a noisy environment, they may have great difficulty in developing such essential skills as distinguishing the sounds of speech. For example, against a background of noise, a child may confuse the sound of "v" in "very" with the "b" in "berry" and may not learn to tell them apart. Another symptom of this problem is the tendency to distort speech by dropping parts of words, especially their endings.

Reading ability also may be seriously impaired by noise. A study of reading scores of 54 youngsters, grades two through five, indicated that the noise levels in their four adjacent apartment buildings were detrimental to the children's reading development. The influence of noise in the home was found to be more important than even the

parents' educational background, the number of children in the family, and the grades the youngsters were in. The longer the children had lived in the noisy environment, the more pronounced the reading impairment.

Assuming a child arrives at school with language skills underdeveloped because of a noisy home, will he or she fare any better at school? Again, the answer may depend on how noisy the classroom is. In a school located next to an elevated railway, students whose classrooms faced the track did significantly worse on reading tests than did similar students whose classrooms were farther away. In Inglewood, California, the effects of aircraft noise on learning were so severe that several new and quieter schools had to be built. As a school official explained, the disruption of learning went beyond the time wasted waiting for noisy aircraft to pass over. Considerable time had to be spent after each flyover re-focusing students' attention on what was being done before the interruption.

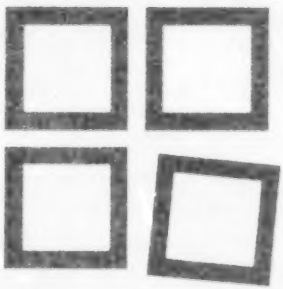
But the problem may be well beyond the capacity of the schools to correct. Children who live in noisy homes and play in noisy areas may never develop the ability to listen well enough to learn once they are of school age. To avoid this prospect, our concern for the health and welfare of the nation's children must be broadened to address the total environment in which they grow up.

Noise may hinder the development of language skills in children

Noise disrupts the educational process

"Interference with speech communication by noise is among the most significant adverse effects of noise on people. Free and easy speech communication is probably essential for full development of individuals and social relations, and freedom of speech is but an empty phrase if one cannot be heard or understood because of noise." EPA Report

Intrusion At Home and Work



If there is one common denominator degrading the quality of all our lives, it may well be the almost constant intrusion of noise — in the home, at work, and in public areas. One of the most bothersome aspects of this intrusion is its interference with conversation. We may not always be aware of it, but we frequently must speak up to be heard. Others must often do the same to be understood by us.

Loss of the ability to speak at a normal level and be heard may be far more damaging than we realize. People who live in noisy places tend to adopt a lifestyle devoid of communication and social interaction. They stop talking, they change the content of the conversation, they talk only when absolutely necessary, and they frequently must repeat themselves. These reactions are probably familiar to all of us.

Interference with indoor conversation represents only a small part of the intrusion problem. Outdoors, the combination of continuous daytime noise caused by street traffic, construction equipment, and aircraft interrupts speech and can discourage conversation there as well. For millions of Americans residing in noisy urban areas, the use of outdoor areas for relaxed conversation is virtually impossible.

Noise not only makes conversation difficult — indoors or out — it also seems to hinder work efficiency. In general, noise is more likely to reduce the accuracy of work rather than the total quantity. And it takes a greater toll on complex compared to simpler tasks. When noise is particularly loud or unpredictable, errors in people's observation tend to increase, perception of time may be distorted, and greater effort is required to remain alert. Loud noise also can increase the

variability of work, leading to breaks in concentration sometimes followed by changes in work rate.

Even when noise does not interfere with the work at hand, work quality may suffer after the noise stops. Studies and reports from individuals also suggest that people who work in the midst of high noise levels during the day are more, rather than less, susceptible to frustration and aggravation after work. Relaxing at home after a noisy workday may not be an easy thing to do. When the home is noisy itself, the tired and irritated worker may never be able to work out the day's accumulated stress during the course of the evening.

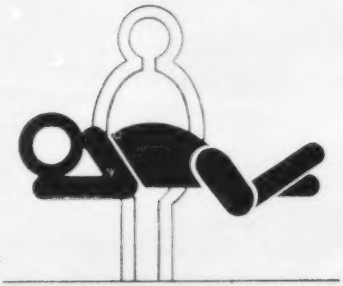
Noise in industrial settings may have the most pronounced effects on human performance and employee health. A coal industry study indicated that intermittent noise conditions during mining have a great likelihood for causing distraction leading to poorer work. Other studies have confirmed additional effects of noise exposure, including exhaustion, absentmindedness, mental strain, and absenteeism — all of which affect worker efficiency. In the words of Leonard Woodcock, former president of the United Auto Workers, "They (auto workers) find themselves unusually fatigued at the end of the day compared to their fellow workers who are not exposed to much noise. They complain of headaches and inability to sleep and they suffer from anxiety . . . Our members tell us that the continuous exposure to high levels of noise makes them tense, irritable, and upset."

Noise interferes with conversation and social interaction

Noise hampers work efficiency

"The din of the modern city [includes] noises far above levels for optimum sleeping. Result: insomnia and instability."
Dr. Edward F. Crippen, Former Deputy Health Commissioner of Detroit

Sleep Disruption



Sleep is a restorative time of life, and a good night's sleep is probably crucial to good health. But everyday experience suggests that noise interferes with our sleep — in a number of ways. Noise can make it difficult to fall asleep, it can wake us, and it can cause shifts from deeper to lighter sleep stages. If the noise interference with sleep becomes a chronic problem, it may take its toll on health.

Human response to noise before and during sleep varies widely among age groups. The elderly and the sick are particularly sensitive to disruptive noise. Compared to young people, the elderly are more easily awakened by noise and, once awake, have more difficulty returning to sleep. As a group, the elderly require special protection from the noises that interfere with their sleep.

Other age groups seem to be less affected by noise at bedtime and while asleep. But their apparent adjustment may simply be the result of failing to remember having awakened during the night. Sleep researchers have observed that their subjects often forget and underestimate the number of times they awaken during sleep. It may be that loud noises during the night continue to wake or rouse us when we sleep, but that as we become familiar with the sounds, we return to sleep more rapidly.

Factors other than age can influence our sleep. Studies suggest that the more frequent noise is, the less likely a sleeper is to respond. Certain kinds of

noises can cause almost certain responses, however. A mother may wake immediately at the sound of a crying baby, but may tune out much louder traffic noise outside.

Disruption of sleep does not necessarily include awakening. Shifting in depths of sleep may be more frequent than awakening. For instance, recent studies have shown that shifts from deep to light sleep were more numerous because of noise, and that light sleep became lengthened at the expense of deep sleep.

Studies have also been made of noise complaints and what kinds of annoyance led people to file them. Surveys taken in communities significantly affected by noise indicated that the interruption of rest, relaxation, and sleep was the underlying cause of many people's complaints.

When noise interferes with our sleep— whether by waking us or changing the depth of sleep — it makes demands on our bodies to adapt. The implications of these demands for our general health and performance are not well understood. Nonetheless, we need restful sleep and many of us are not getting it. As a result, for millions of Americans, trying to get a good night's sleep still means reaching for sleeping pills.

Noise affects the quantity and quality of sleep

The elderly and sick are more sensitive to disruptive noise

When sleep is disturbed by noise, work efficiency and health may suffer

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"The Noise, The Noise. I just couldn't stand the Noise."
Suicide note left by a desperate homeowner.

Mental and Social Well-Being

The most obvious price we pay for living in an overly noisy world is the annoyance we frequently experience. Perhaps because annoyance is so commonplace, we tend to take our daily doses of it for granted — not realizing that the irritability that sometimes surfaces can be a symptom of potentially more serious distress inside us. When noise becomes sufficiently loud or unpredictable, or if the stress imposed is great enough, our initial annoyance can become transformed into more extreme emotional responses and behavior. When this happens, our tempers flare and we may "fly off the handle" at the slightest provocation.

Newspaper files and police records contain reports of incidents that point to noise as a trigger of extreme behavior. For instance, a night clerical worker, upset about noise outside his apartment, shot one of the boys causing the disturbance after he had shouted at them, to no avail, to "Stop the noise." As other examples, sanitation workers have been assaulted, construction foremen threatened, and motorboat operators shot at — all because of the noise they were producing.

Such extreme actions are not the usual responses to noise and stress. Some people cope with loud noise by directing their anger and frustration inward, by blaming themselves for being upset, and by suffering in silence. Others resort to a denial of the problem altogether, considering themselves so tough that noise does not bother them. Still others deal with noise in a more direct manner: they take sleeping pills and wear ear plugs, increase their visits to doctors and keep their windows closed, rearrange their sleeping quarters and spend less time outdoors, and write letters of complaint to government officials.

Most of the time these ways of contending with noise are not likely to eliminate the noise or any underlying annoyance. Short of taking extreme action — which is unlikely to solve the problem

either — most people who cannot cope with noise in these ways typically direct their anger and frustration at others and become more argumentative and moody, though not necessarily violent. This noise-induced, anti-social behavior may be far more prevalent than we realize.

Indeed, noise can strain relations between individuals, cause people to be less tolerant of frustration and ambiguity, and make people less willing to help others. One recent study, for example, found that, while a lawnmower was running nearby, people were less willing to help a person with a broken arm pick up a dropped armload of books. Another study of two groups of people playing a game found that the subjects playing under noisier conditions perceived their fellow players as more disagreeable, disorganized, and threatening. Several industrial studies indicate that noise can heighten social conflicts both at work and at home. And reports from individuals suggest that noise increases tensions between workers and their supervisors, resulting in additional grievances against the employer.

Although no one would say that noise by itself brings on mental illness, there is evidence that noise-related stress can aggravate already existing emotional disorders. Research in the United States and England points to higher rates of admission to psychiatric hospitals among people living close to airports. And studies of several industries show that prolonged noise exposure may lead to a larger number of psychological problems among workers.

Noise can cause extreme emotions and behavior

Anti-social behavior caused by noise may be more prevalent than is realized

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"Inability to hear auditory warning signals or shouts of caution because of noise has also been implicated in industrial accidents." Alexander Cohen, National Institute for Occupational Safety and Health

Danger to Life and Limb

Two people were killed when Senator Robert Kennedy's funeral train passed through Elizabeth, New Jersey. Because of the noise from Secret Service and news media helicopters, they did not hear the warning blasts from the train that hit them.

Although the evidence is scanty, the inability to hear warning signals because of high background noise is thought to be the cause of many accidents each year. For example, traffic accidents occur and lives are lost because drivers are unable to hear the sirens from nearby or passing emergency vehicles. One study has estimated that when a fire truck or ambulance is in the process of passing a truck, the truck driver is able to detect the siren for only a very short time — three seconds or less. The rest of the time the truck's noise drowns out the siren, and the warning is undetected.

Nowhere is the concern over preventable accidents greater than in industrial settings, where noise levels not only can interfere with concentration and can cause hearing loss, but can hinder communication between employees as well — particularly in times of emergency. A study of medical and accident records of workers in several industries found that a significantly higher number of reported accidents occurred in noisier plant areas. The Federal Railroad Administration is aware of this hazard and has identified "high noise-level conditions" as a possible contributor in 19 accidents causing deaths of 25 railroad employees, in a 22-month period.

Reports from industrial officials also indicate that the effectiveness of warning signals and shouts in noisy areas is considerably diminished and that accidents and injuries are more fre-

quent. The effects of masking and speech interference can be dramatic, as in the case of an accident in an auto glass manufacturing plant. Noise levels were so high that a worker whose hand was caught in manufacturing equipment received no aid since no one heard the screams. As a result, the hand was lost. As additional examples, two press-room auto workers in Ohio were permanently disabled when they failed to hear approaching panel racks or warning shouts.

Thus it is an unfortunate result of high background noise levels that people cannot respond in life and death situations when they are unable to hear approaching hazards or shouts of alarm.

Noise can obscure warning signals, causing accidents to occur

Noise can interfere with shouts for help, preventing rescue attempts

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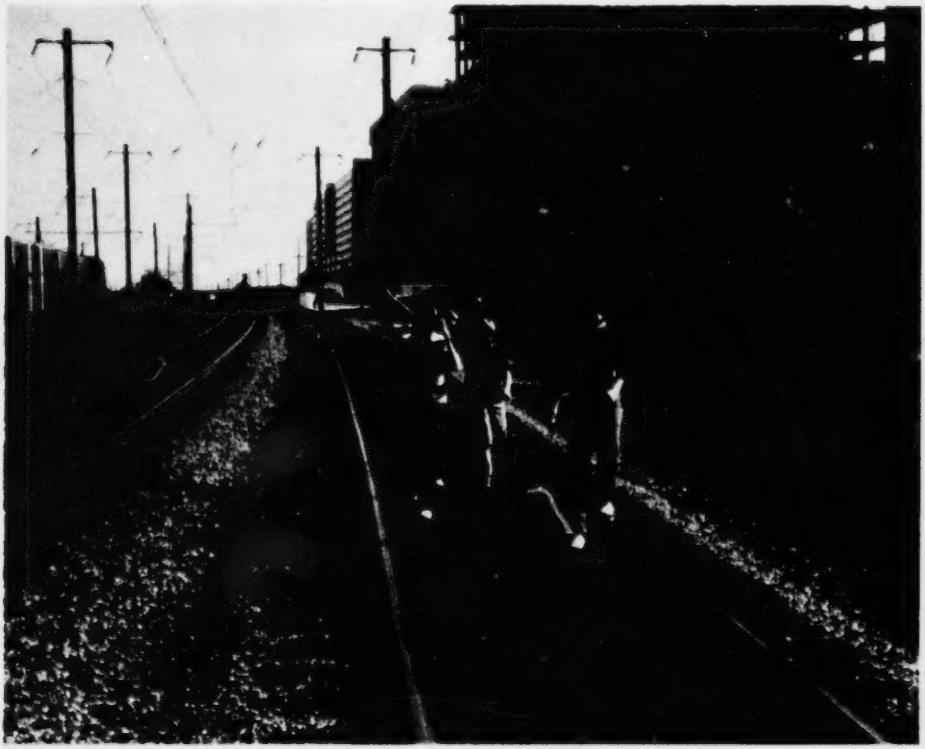

"It is truly a serious problem to escape from noise."
William Dean Howells, American Author

A Final Word

23

When unwanted sounds intrude into our environment, noise exists. We have all experienced to varying degrees the annoyance and irritation caused by noise. Sometimes this annoyance is brought about by disruption of our sleep or difficulty in falling asleep. At other times, it may be because we have to raise our voices over background noise to be heard or because we are distracted from our activities.

Except for the serious problem of hearing loss, there is no human illness known to be directly caused by noise. But throughout dozens of studies, noise has been clearly identified as an important cause of physical and psychological stress, and stress has been directly linked with many of our most common health problems. Thus, noise can be associated with many of these disabilities and diseases, which include heart disease, high blood pressure, headaches, fatigue and irritability.

Noise is also suspected to interfere with children's learning and with normal development of the unborn child. Noise is reported to have triggered extremely hostile behavior among persons presumably suffering from emotional illness. It is suspected to lower our resistance, in some cases, to the onset of infection and disease.

However, most Americans are largely unaware that noise poses such significant dangers to their health and welfare. The reasons for this lack of awareness are clear. Noise is one of many environmental causes of stress and cannot easily be identified as the source of a particular physical or mental ailment by the layman. Another reason is that biomedical and behavioral research is only now at the point where health hazards stemming from noise can actually be named, even though some specific links have yet to be found.

Dr. William H. Stewart, former Surgeon General, in his keynote address to the 1969 Conference on Noise as a Public Health Hazard, made the following point: "Must we wait until we prove every link in the chain of causation? I stand firmly with (Surgeon General) Burney's statement of 10 years ago. In protecting health, absolute proof comes late. To wait for it is to invite disaster or to prolong suffering unnecessarily. I submit that those things within man's power to control which impact upon the individual in a negative way, which infringe upon his sense of integrity, and interrupt his pursuit of fulfillment, are hazards to public health."

It is finally clear that noise is a significant hazard to public health. Truly, noise is more than just an annoyance.

While this booklet contains reliable and important information on Noise, it is not published in support of any specific EPA Noise Regulation. The technical supporting documentation for any specific EPA Noise regulation will be published in a background document which accompanies the regulation.

"Calling noise a nuisance is like calling smog an inconvenience. Noise must be considered a hazard to the health of people everywhere."

Dr. William H. Stewart, former U.S. Surgeon General

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